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(54) Containment valve that allows contamination free transfer

Behälterventil für verschmutzungsfreie Übertragung

Vanne de conteneur pour transfert sans contamination

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(73) Proprietor: **ELI LILLY AND COMPANY**
Indianapolis, Indiana 46285 (US)

(72) Inventors:
- **Bandy, Michael Jay**
  Greenwood, Indiana 46142 (US)
- **Byerly, Roy Howard**
  Indianapolis, Indiana 46236 (US)
- **Spoonmore, Robert Thomas**
  Indianapolis, Indiana 46254 (US)

(74) Representative: **Atkinson, Peter Birch et al**
MARKS & CLERK,
Sussex House,
83-85 Mosley Street
Manchester M2 3LG (GB)

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Description

Background of the Invention

The present invention relates generally to valves, and more specifically relates to butterfly valves which may be coupled and uncoupled without exposing the content of the valves to the outside environment.

Valves are used in material handling such as to regulate the flow of powder in conduits and in and out of containment vessels. In certain applications, it is important to isolate the material from the outside environment. For example, in chemical industries and pharmaceutical industries it may be necessary to isolate a material from the environment to maintain the purity and sterility of the material, to protect the outside environment from toxic or other harmful effects of the material, or both. However, some applications require not only regulation of flow through the valve, but also the ability to separate the conduit and/or containment vessel while maintaining the integrity of the system. This may be especially desirable where chemicals being handled are granular or in the form of a powder.

One prior device is disclosed in Soviet Inventor's Certificate No. 905,149 which shows two spring-biased elliptically shaped butterfly valves which are forced open upon coupling of two conduits. Another device is shown in Brazilian Patent No. PI 8705947A which discloses a three-stage valve used in powder transfer. Another device is shown in Soviet Inventors Certificate No. 644,676 which discloses a valve controlled coupling member with two butterfly valve halves with their axis of rotation at 90° with respect to the direction of flow through the valve and with elastomeric seals. U.S. Patent No. 3,106,223 discloses a disconnectable coupling with two valve halves on an axis 45° across the port with elastomeric sealing rings and with a bayonet coupling between different ports.

The present invention provides advantages over these prior devices while maintaining a relatively simple design which is interchangeable with corresponding valve halves, and is readily cleaned and sterilized and assembled by the operator.

SUMMARY OF THE INVENTION

According to the present invention there is provided a valve system defined in claim 1.

The present invention may further provide a valve system in which butterfly valve bodies and corresponding locking members are interchangeable and have elastomeric seals.

The present invention may further provide a valve system with two valve halves and with hermaphroditic ports which will mate both across the X-axis and the Y-axis.

One object of the present invention is to provide a containment valve that allows dust free powder transfer.

In a preferred embodiment the present invention provides a valve system which, when separated maintains a vessel in a separate container completely sealed with all exposed surfaces of the valve cleaned before and after connection.

In a preferred embodiment the present invention provides a valve which is accident proof from opening when the system is separated and a valve which provides dust free powder transfer without obstructing the line of powder flow when the system is together.

In a preferred embodiment the present invention provides a valve system in which the valve pieces are completely cleanable and sterilizable and in which valve halves are identical and fit together interchangeably.

In a preferred embodiment the present invention provides the foregoing advantages with a valve which does not require a person to reach into a line of powder flow for valve operation and which allows valve operation in either direction so a container can be loaded or unloaded through the same valve.

These and other advantages of the present invention will be apparent from the written description and drawings herein.

Brief Description of the Drawings

Fig. 1 is a perspective view of one embodiment of the present invention showing one-half of tie assembly exploded.

Fig. 2 is a perspective view of the device of Fig. 1 assembled mode and with the butterfly valve bodies closed.

Fig. 3 is a perspective view of the device of Fig. 1 fully assembled in a coupled mode and with the butterfly valve bodies open.

Fig. 4 is a top plan view of the device illustrated in Fig. 2.

Fig. 5 is a side view of the first embodiment of the present invention shown in an uncoupled mode and partially cut away.

Fig. 6 is a top plan view of one locking member of the device of Fig. 1 shown in isolation.

Fig. 7 is a side view of the locking member of Fig. 6.

Fig. 8 is a top plan view of one butterfly valve body of the device of Fig. 1 shown in isolation.

Fig. 9 is a side view of the butterfly valve body of Fig. 8.

Fig. 10 is a cross-sectional detail taken along lines 10-10 of Figs. 8 and 9.

Fig. 11 is a bottom plan view of a second embodiment of a butterfly valve body for use in the present invention having a pair of annular ribs.

Fig. 12 is a side, partially cut-away view of the valve body of Fig. 11.

Fig. 13 is a bottom plan view of a second embodiment of a butterfly valve body for use in the present invention having a pair of annular grooves.

Fig. 14 is a side, partially cut-away view of the valve

body of Fig. 13.

Fig. 15 is a top plan view of a second embodiment of a container port for use in the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Specific embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings.

Generally, the invention shown has two container ports 23 and 25 which may be coupled together, and are held together by two pairs of prongs. A butterfly valve opens and closes between the two ports and consists of two halves, valve body 27 and valve body 29. When the container ports are uncoupled, the respective valve bodies separate, keeping each of the two ports sealed closed. Two locking members 31 and 33 lock and unlock the butterfly valve and help couple the two ports together.

Referring to Figs. 1-10, a single example of the present invention is illustrated as valve system 21. In this embodiment, there are six major components: first container port 23, second container port 25, first butterfly valve body 27, second butterfly valve body 29, first locking member 31 and second locking member 33. As illustrated, the container ports are essentially identical to each other, the butterfly valve bodies are essentially identical to each other and the locking member are essentially identical to each other, resulting in two identical three-part subassemblies (see Figs. 1 and 5) of the overall valve system 21.

Container ports 23 and 25 in use are attached to any one of a variety of conduits, containers, vessels or other chambers in which material to be handled is kept. The invention has particular application with respect to handling and transferring solid materials, such as toxic, sterile and/or corrosive solids, including powders and dusts. However, the present invention has applicability with other solids such as crystals, particulates, granulars and/or tablets useful in the pharmaceutical industry or other industries and may also be used in handling liquids or gases. A key attribute of the present invention is that it allows container port 23 and container port 25 to be separated from one another in an uncoupled mode (see Fig. 5) while maintaining the powder or other material inside the respective container ports, sealed from the outside environment. Conversely, when container port 23 and container port 25 are held together in a coupled mode, the two butterfly valve bodies 27 and 29 pivot together with valve system 21 acting as a valve between container port 23 and container port 25. As illustrated, the container ports include an outer wall defining an inner conduit volume through which the material being handled passes.

Locking member 31 and locking member 33 preferably are annular rings disposed externally around the circumference of container port 23 and container port 25 respectively. The locking members are moveable, preferably through circumferential rotation, with respect to the container ports between a first position and a second position for locking and unlocking the butterfly valve bodies. The locking members act to lock each of their respective butterfly valve bodies closed when system 21 is in an uncoupled mode (Fig. 5) but unlocks them and allows them to pivot about axis A when the container ports are in a coupled mode (e.g. Fig. 3).

Figs. 8-10 illustrate a typical butterfly valve body, such as valve body 27, in isolation. The valve body includes a generally planar section 35 having a generally planar face 37 on the inside thereof which will mate with a corresponding generally planar face of valve body 29. Note that in the preferred embodiment the middle region of face 37 is ground slightly concave leaving a slight gap between the planar sections of the valve bodies to enhance the tight-fitting perimeter seal between valve body 27 and valve body 29 to prevent dust or other contaminants from getting on face 37 so that it is essentially free from powder from container ports 23 and 25. Planar section 35 is secured to pivot shaft 39 which, as illustrated, is hemicylindrical to mate with a corresponding hemicylindrical pivot shaft of adjacent butterfly valve body 29 to form a cylindrical pivot shaft which is rotatable between the container ports. A pair of handles, such as handle 41, are secured to pivot shaft 39. Handle 41 serves a dual function in the preferred embodiment. The first function is to provide a convenient handle to grasp and pivot the butterfly valve bodies. The second function is to provide locking engagement with a radially projecting locking tab (discussed below) of the corresponding locking member 31. Specifically, in this embodiment locking is provided by having the locking member engage locking surface 43 (see Figs. 9 and 10) on the bottom surfaces of the horizontal flange of handle 41. Similar locking surfaces are provided on both handles of each butterfly valve body. An elastomeric ring, such as elastomeric ring 28 (see Fig. 5), lines the inner wall of port 23 to provide a snug seal with butterfly valve body 27. A similar seal is provided between valve body 29 and port 25.

Referring to Figs. 6 and 7, locking member 31 is illustrated including annular ring member 45 with two radially projecting handles 47 and 49. A pair of radially projecting tabs 51 and 53 are provided on ring 45 defining locking surface 55 and locking surface 57 respectively. These locking surfaces engage the locking surfaces, such as locking surface 43, on the butterfly valve bodies as , illustrated in Figs. 8-10. In the preferred embodiment, locking surfaces 55 and 57 are made of a softer material than the metal used on surface 43 to prevent galling, it having been found that Delrin (Trade Mark) brand plastic (offered by Du Pont) is suitable for these surfaces. Similarly to prevent galling a ring of softer material (e.g. Delrin (Trade Mark) brand plastic) 58 is provided between locking member 31 and the radial flange 60 (see Figs. 1 and 5) of port 23. A similar ring of bushing material 62 is provided between locking member 33 and

port 25. In operation of valve system 21, when the locking member is rotated circumferentially by applying circumferential force on handles 47 and 49 to slide the locking surfaces together, such as surface 55 in contact with surface 43, pivoting of the butterfly valve bodies about axis A is prevented (see Figs. 2 and 4). In this locked mode, the two container ports may be separated without having butterfly valve body 27 or 29 inadvertently opening and thereby exposing the contents of material inside the container ports.

Furthermore, in this locked, uncoupled mode the locking members, such as locking member 31, are prevented from inadvertently rotating to an unlocked position by the operation of a spring biased pin and recess arrangement. More specifically, referring to Fig. 5 an axially projecting pin 59 is secured to container port 25 whereas a corresponding recess 61 is provided in container port 23 for receiving pin 59. Inside of recess 61 is a spring biased pin 63 urged into recess 61 by spring 65. Reciprocating pin 63 and spring 65 are mounted to first locking member 31 on its annular ring portion. When valve system 21 is in its locked, uncoupled mode spring 65 urges pin 63 into recess 61, thereby locking container port 23 and locking member 31 against movement circumferentially with respect to each other. However, when the two subassemblies of valve system 21 are placed together in a coupled mode, mating pin 59 contacts pin 63 and urges it out of recess 61, thereby allowing rotation of locking member 31 with respect to container port 23.

Furthermore, mating pin 59 and recess 61 provide for proper alignment of the two halves of valve system 21 when being coupled. There is an inverse and hermaphroditic mating pin 67 arid recess 69 in container port 23 and container port 25 respectively as illustrated, functioning essentially the same as mating pin 59 and recess 61, with a spring bias pin identical to pin 63 in recess 69 so as to prevent and to allow rotation of locking member 33 with respect to container port 25.

Radially projecting stop 81 contacts prong 73 (see Fig. 4) to prevent over-rotation of locking member 31 in the locked, uncoupled mode. Conversely, stop 83 prevents over-rotation by contacting prong 73 when moving the locking member into the unlocked, coupled mode. Identical stops are provided on locking member 33.

The two subassemblies of container port 23 and of container port 25 are coupled together by the interaction of four locking prongs with the two locking members 31 and 33. Three of the four locking prongs are illustrated as prongs 71, 73 and 75. The fourth prong, which is secured to container port 23, is not illustrated due to the cutaway drawing configuration in Fig. 5, but is located diametrically across from prong 75 similar to the relationship between prongs 71 and 73. In the preferred embodiment, each of the prongs have locking member surfaces in the form of rollers. Prong 73 is typical, having roller 77 thereon. Alternately, the prongs may provide bayonet mounting through slots, holding the ports together (not shown). Similar to surfaces 55 and 57, preferably the rollers are made of a softer material, such as plastic, to prevent galling when brought in engaging contact with the respective locking member. When container port 23 and container port 25 are in a coupled mode, roller 77 acts as a locking surface and is rolled into engagement with locking surface 79 which, in the preferred. embodiment, is on annular ring member 45 of the first locking member 31. This engagement is caused by circumferentially rotation of locking member 31 so the system is in the coupled mode. This surface is slightly ramped to facilitate receiving of the roller as the locking member is rotated. In the coupled mode, the remaining three rollers likewise engage similar locking surfaces on the locking members. The invention works best if tolerances are held to within 3.9×10^{-3}mm (0.001 inches), particularly on the critical locking surfaces and faces between moving parts.

Furthermore, in the unlocked mode (see Fig. 3) the locking tabs 51 and 53 are no longer in engagement with the handles and locking surface (e.g. locking surface 43) of the butterfly valve bodies, thereby allowing them to pivot about axis A. Accordingly, the present invention provides a locking system which is mutually exclusive between two modes, a coupled mode in which the butterfly valves are free to pivot so as to open and close the valve, and an uncoupled mode in which the respective halves of the butterfly valve are locked in a closed position so as to maintain containment integrity of the system. It is significant that in this configuration in the coupled mode the valve body collectively defined by valve bodies 27 and 29 may be completely pivoted in excess of 180° and even in excess of 360° inside the container ports. This is useful in that there may be times when closing of the butterfly valve may be obstructed by a localised piece of the material in the valve when the valve is rotated in one direction, but that by rotating the valve in an opposite direction the operator may avoid or break up the obstruction and close the valve. As stated before, it is preferable that the respective halves of the valve system are interchangeable and preferably hermaphroditic with one another. In this way, when the various component parts are disassembled, which may readily be done with the present invention for cleaning and/or sterilising, their reassembly may be done universally without the risk of error in combining improper components. Furthermore, this feature provides versatility in that it facilitates material handling between various vessels. For example, if there are three vessels, vessel A, vessel B and vessel C, each having a corresponding half of valve system 21 including a first container port and a first butterfly valve body, due to their interchangeable and hermaphroditic structure they may be freely connected with one another. In other words, any of the coupling permutations may be achieved such as connecting vessels A and B, vessels A and C, and/or vessels B and C without concern of whether the appropriate valve fittings will match one another.

Another design advantage of this valve is the mating guide pins designed so as to facilitate the mating of the valve halves. The pins permit the mating of the valve halves even when slightly misaligned. This feature is critical when using the valves in an automatic mode. With the broad mating tolerance in the pins this design, robotically mating the valve is practical.

Referring to Figs. 11-15, a second embodiment of the present invention is disclosed in the form of modifications to certain components of the present invention. Figs. 11-15 utilize analogous reference characters as used in connections with Figs. 1-10 except that a "1" or "2" is present in the hundredths digit for analogous structure. For example, pivot shaft 239 in Figs. 11 and 12 and pivot shaft 139 if Figs. 13 and 14 are analogous to pivot shaft 39 in the previous Figures. Butterfly valve body 227 in Figs. 11 and 12 differes from the valve body of Figs. 8 and 9 by the presence of a pair of annular ribs, such as annular rib 237a near the outermost circumference of generally planer section 235 along its inside face. Annular rib 237a mates with a corresponding annular groove 137a illustrated in Figs. 13 and 14 on valve body 127. The interaction of such annular ribs and grooves or other such projections and recesses around the periphery of planer sections 135 and 235 help provide a better seal so as to prevent dust or other material from contaminating the face to face surfaces of sections 135 and 235. Handles 141 and 241 and locking surfaces 143 and 243 function as previously described with respect to handles 41 and locking surfaces 43. Note that when the modified valve bodies of Figs. 11-14 are utilized, complete hermaphroditic mating between two respective halves is not present in the embodiment as illustrated. Variations are possible such as having annular ribs on one face of section 137 with annular grooves on an opposite face thereof with corresponding modification of shaft 139 and handle 141 to allow a single part design while providing rib-groove mating as previously described. Alternatively, the single face of section 135 may have both circumferential ribs and grooves in diametrically opposite halves or quadrants to provide sealing while maintaining hermaphroditic mating.

Fig. 15 illustrates a modified construction of the container port of the present invention. Container port 123 is essentially the same as container port 23 except that it provides hermaphroditic mating both about Y-axis and about the X-axis. This is accomplished by having the axially male protrusion of pin 159 symmetrically across the Y-axis from recess 161 and symmetrically across the X-axis from recess 169. Similarly, axially male protrusion in the form of pin 167 is symmetrically across from the Y-axis from recess 169 and symmetrically across the X-axis from recess 161. Furthermore, roller 177a mounted to prong 171 is symmetrically across the Y-axis from recess 178a and symmetrically across the X-axis from recess 178b. Similarly, roller 177b mounted on prong 173 is symmetrically across the Y-axis from recess 178b and is symmetrically across the X-axis from recess 178a. As illustrated, the +X, +Y quadrant of container port 123 is a mirror image of the -X, -Y quadrant. Likewise, the +X, -Y quadrant is a mirror image of the -X, +Y quadrant. In this way, two container ports as illustrated in Fig. 15 may be hermaphroditically mated about the Y-axis as well as about the X-axis. Note that the X-axis in the illustrated embodiment is the axis of rotation of the two butterfly valve bodies previously described. The illustrated face of flange 160 preferably lies in the X-Y plane, normal to a Z-axis generally along the flow direction through the ports. Accordingly, the configuration of Fig. 15 at least doubles the mating interaction possibilities of the present inventive valve system having two butterfly valve bodies or ball valve bodies with apertures therein.

Claims

1. A valve system, comprising:

a first container port (23) and a second container port (25) which are uncoupleable and coupleable with respect to each other between an uncoupled mode and a coupled mode respectively;

a first butterfly valve body (27) initially mounted in said first container port (23) and pivotable about an axis, wherein said first butterfly valve body (27) in a closed position seals the first port (23) against flow of material therethrough;

a second butterfly valve body (29) initially mounted in said second container port (25) and pivotable about said axis, wherein said second butterfly valve body (29) in a closed position seals the second port (25) against flow of material therethrough, wherein in said coupled mode said first and second butterfly valve bodies (27, 29) are immediately adjacent each other and are simultaneously pivotable about said axis to an open position to allow flow of material through the first and second ports;

a first locking member (31) which is rotatable circumferentially with respect to the first port (23) from a first circumferential position to a second circumferential position, wherein said first circumferential position said first locking member (31) locks said first butterfly valve body (27) in said closed position so that the first butterfly valve body cannot be moved to said open position unless the locking member is first moved to said second circumferential position wherein said first locking member unlocks said first butterfly valve body (27) to allow pivoting of said first butterfly valve body (27) to said open position independently from said first locking member (31).

2. The valve system of claim 1, wherein when said container ports (23, 25) are in said coupled mode with said first locking member (31) in its second circumferential position, and first and second valve bodies (27, 29) are allowed to pivot 180° about said axis to an inverted valve body position, and wherein when said valve bodies (27, 29) are in said inverted valve body position said first and second container ports (23, 25) are uncoupleable with said second butterfly valve body (29) mounted in said first container port (23) and with said first butterfly valve body (27) mounted in said second container port (25).

3. The valve system of claim 1 or claim 2, wherein said first locking member (31) in said second circumferential position further locks the first port (23) and the second port (25) together in said coupled mode.

4. The valve system of any preceeding claim, wherein said first butterfly valve body (27) and said second butterfly valve body (29) each have generally planar faces (235, 135) having at least one set of an interfitting rib (237a) and groove (137a) around a perimeter thereof, wherein adjacent faces of said adjacent first butterfly valve body (27) and second butterfly valve body (29) are in contact with each other with said rib and groove set to provide a dust-tight seal therebetween in said coupled mode, whereby in said uncoupled mode said faces of said first and second butterfly valve bodies (27, 29) are exposed and are essentially free of dust from the first port (23) and the second port (25).

5. The valve system of any preceeding claim, wherein said second circumferential position said first locking member (31) allows selective pivoting of said first and second butterfly valve bodies (27, 29) between said closed position and said open position, wherein said butterfly valve bodies (27, 29) are pivotable in excess of 360° about said axis while said first and second container ports (23, 25) are in said coupled mode.

6. The valve system of any preceeding claim, further comprising a spring biased pin (63) and a corresponding recess (61) for receiving said pin located between said first locking member (31) and the first port (23), wherein said pin (63) engages said recess (61) when said first locking member (31) is in its first circumferential position, and wherein said pin (63) and recess (61) block inadvertent rotation of said first locking member (31) out of its first circumferential position to maintain said first butterfly valve body (27) locked in its closed position in said uncoupled mode.

7. The valve system of any preceding claim, further comprising a second locking member (33) which is rotatable circumferentially with respect to the second port (25) from a first circumferential position to a second circumferential position, wherein said first circumferential position said second locking member (33) locks said second butterfly valve body (29) in said closed position, and wherein said second circumferential position said second locking member (3) unlocks said second butterfly valve body (29) to allow pivoting of said second butterfly valve body (29) to said open position independently from said first locking member (31).

8. The valve system of claim 7, wherein said second locking member (33) in said second circumferential position further locks the first port (23) and the second port (25) together in said coupled mode.

9. The valve system of claim 7 or claim 8, wherein said uncoupled mode said first butterfly valve body (27) said second butterfly valve body (29), said first locking member (31), and said second locking member (33) are disassembleable apart from each other and apart from the first port (23) and the second port (25);

   wherein said first butterfly valve body (27) is interchangeable with said second butterfly valve body (29); and
   wherein said first locking member (31) is interchangeable with said second locking member (33).

10. The valve system of any preceding claim, further comprising elastomeric means (28) between said first butterfly valve body (27) and said first container port (23) and between said second butterfly valve body (29) and said second container port (25) for providing a seal.

11. The valve system of any preceding claim, wherein said first container port and said second container port are hermaphroditically interfittable with respect to each other;

   and wherein said container ports have a set of male protrusions (159, 167) and a set of female recess (161, 169) which deviate from a transverse X-Y plane defined by a transverse Y-axis and a transverse X-axis, wherein a given male protrusion (159) has a first intermitting recess (169) symmetrically across said X-axis and a second interfitting recess (161) symmetrically across said Y-axis to allow hermaphroditic mating of said ports both about said X-axis and about said Y-axis.

Patentansprüche

1. Armatursystem, das folgendes umfaßt:

   eine erste Behälteröffnung (23) und eine zweite Behälteröffnung (25), die relativ zueinander zwischen einer entkoppelten Betriebsart und einer gekoppelten Betriebsart entkoppelbar bzw. koppelbar sind;
   einen ersten Klappenarmaturkörper (27), der anfangs in der ersten Behälteröffnung (23) angebracht ist und um eine Achse schwenkbar ist, wobei der erste Klappenarmaturkörper (27) in einer geschlossenen Stellung die erste Öffnung (23) gegen einen Materialfluß dadurch abdichtet;
   einen zweiten Klappenarmaturkörper (29), der anfangs in der zweiten Behälteröffnung (25) angebracht ist und um die genannte Achse schwenkbar ist, wobei der zweite Klappenarmaturkörper (29) in einer geschlossenen Stellung die zweite Öffnung (25) gegen einen Materialfluß dadurch abdichtet, wobei der erste und der zweite Klappenarmaturkörper (27, 29) in der gekoppelten Betriebsart unmittelbar aneinander angrenzen und gleichzeitig um die Achse in eine offene Stellung schwenkbar sind, um einen Materialfluß durch die erste und die zweite Öffnung zu ermöglichen;
   ein erstes Arretierglied (31), das dem Umfang nach relativ zur ersten Öffnung (23) aus einer ersten Umfangsstellung in eine zweite Umfangsstellung drehbar ist, wobei das erste Arretierglied (31) in der ersten Umfangsstellung den ersten Klappenarmaturkörper (27) in der geschlossenen Stellung arretiert, so daß der erste Klappenarmaturkörper nicht in die offene Stellung bewegt werden kann, außer wenn das Arretierglied zunächst in die zweite Umfangsstellung bewegt wird, wobei das erste Arretierglied den ersten Klappenarmaturkörper (27) entarretiert, um unabhängig vom ersten Arretierglied (31) ein Schwenken des ersten Klappenarmaturkörpers (27) in die offene Stellung zu ermöglichen.

2. Armatursystem nach Anspruch 1, bei dem dann, wenn sich die Behälteröffnungen (23, 25) in der gekoppelten Betriebsart befinden, wenn sich das erste Arretierglied (31) in seiner zweiten Umfangsstellung befindet, dem ersten und dem zweiten Armaturkörper (27, 29) ermöglicht wird, um 180° um die genannte Achse in eine umgekehrte Armaturkörperstellung zu schwenken, und bei dem dann, wenn sich die Armaturkörper (27, 29) in der umgekehrten Armaturkörperstellung befinden, die erste und die zweite Behälteröffnung (23, 25) entkoppelbar sind, wobei der zweite Klappenarmaturkörper (29) in der ersten Behälteröffnung (23) angebracht ist und der erste Klappenarmaturkörper (27) in der zweiten Behälteröffnung (25) angebracht ist.

3. Armatursystem nach Anspruch 1 oder Anspruch 2, bei dem das erste Arretierglied (31) ferner in der zweiten Umfangsstellung die erste Öffnung (23) und die zweite Öffnung (25) in der gekoppelten Betriebsart zusammenschließt.

4. Armatursystem nach einem der vorhergehenden Ansprüche, bei dem der erste Klappenarmaturkörper (27) und der zweite Klappenarmaturkörper (29) jeweils allgemein ebene Seitenflächen (235, 135) aufweisen, die um eine äußere Begrenzung davon mindestens einen Satz aus einer ineinanderpassenden Rippe (237a) und Nut (137a) aufweisen, wobei angrenzende Seitenflächen des angrenzenden ersten Klappenarmaturkörpers (27) und des zweiten Klappenarmaturkörpers (29) in Kontakt miteinander stehen, wobei die Rippe und die Nut dazu eingestellt sind, in der gekoppelten Betriebsart eine staubdichte Dichtung dazwischen bereitzustellen, wodurch die Seitenflächen des ersten und des zweiten Klappenarmaturkörpers (27, 29) in der ungekoppelten Betriebsart freiliegen und im wesentlichen frei von Staub von der ersten Öffnung (23) und der zweiten Öffnung (25) sind.

5. Armatursystem nach einem der vorhergehenden Ansprüche, bei dem das erste Arretierglied (31) in der zweiten Umfangsstellung ein selektives Schwenken des ersten und des zweiten Klappenarmaturkörpers (27, 29) zwischen der geschlossenen Stellung und der offenen Stellung ermöglicht, wobei die Klappenarmaturkörper (27, 29) um mehr als 360° um die Achse schwenkbar sind, während sich die erste und die zweite Behälteröffnung (23, 25) in der gekoppelten Betriebsart befinden.

6. Armatursystem nach einem der vorhergehenden Ansprüche, das ferner einen mit einer Feder vorbelasteten Stift (63) und eine entsprechende Aussparung (61) zur Aufnahme des Stifts umfaßt, die sich zwischen dem ersten Arretierglied (31) und der ersten Öffnung (23) befindet, wobei der Stift (63) die Aussparung (61) in Eingriff nimmt, wenn sich das erste Arretierglied (31) in seiner ersten Umfangsstellung befindet, und wobei der Stift (63) und die Aussparung (61) eine unbeabsichtigte Drehung des ersten Arretierglieds (31) aus seiner ersten Umfangsstellung blockieren, um den ersten Klappenarmaturkörper (27) in der entkoppelten Betriebsart in seiner geschlossenen Stellung arretiert zu halten.

7. Armatursystem nach einem der vorhergehenden Ansprüche, das ferner ein zweites Arretierglied (33)

umfaßt, das dem Umfang nach relativ zur zweiten Öffnung (25) aus einer ersten Umfangsstellung in eine zweite Umfangsstellung drehbar ist, wobei das zweite Arretierglied (33) in der ersten Umfangsstellung den zweiten Klappenarmaturkörper (29) in der geschlossenen Stellung arretiert und wobei das zweite Arretierglied (33) in der zweiten Umfangsstellung den zweiten Klappenarmaturkörper (29) entarretiert, um unabhängig vom ersten Arretierglied (31) ein Schwenken des zweiten Klappenarmaturkörpers (29) in die offene Stellung zu ermöglichen.

8. Armatursystem nach Anspruch 7, bei dem das zweite Arretierglied (33) in der zweiten Umfangsstellung ferner die erste Öffnung (23) und die zweite Öffnung (25) in der gekoppelten Betriebsart zusammenschließt.

9. Armatursystem nach Anspruch 7 oder Anspruch 8, bei dem in der entkoppelten Betriebsart der erste Klappenarmaturkörper (27), der zweite Klappenarmaturkörper (29), das erste Arretierglied (31) und das zweite Arretierglied (33) voneinander und von der ersten Öffnung (23) sowie von der zweiten Öffnung (25) abgebaut werden können;

bei dem der erste Klappenarmaturkörper (27) mit dem zweiten Klappenarmaturkörper (29) austauschbar ist; und
bei dem das erste Arretierglied (31) mit dem zweiten Arretierglied (33) austauschbar ist.

10. Armatursystem nach einem der vorhergehenden Ansprüche, das ferner zwischen dem ersten Klappenarmaturkörper (27) und der ersten Behälteröffnung (23) und zwischen dem zweiten Klappenarmaturkörper (29) und der zweiten Behälteröffnung (25) zur Bereitstellung einer Dichtung ein elastomeres Mittel (28) umfaßt.

11. Armatursystem nach einem der vorhergehenden Ansprüche, bei dem die erste Behälteröffnung und die zweite Behälteröffnung zwitterartig relativ zueinander zusammenpassen;

und bei dem die Behälteröffnungen einen Satz nach außen gewandter Vorsprünge (159, 167) und einen Satz nach innen gewandter Aussparungen (161, 169) aufweisen, die von einer quer verlaufenden X-Y-Ebene, die durch eine quer verlaufenden Y-Achse und eine quer verlaufende X-Achse definiert wird, abweichen, wobei ein gegebener nach außen gewandter Vorsprung (159) eine erste zusammenpassende Aussparung (169) symmetrisch quer über die X-Achse und eine zweite zusammenpassende Aussparung (161) symmetrisch quer über die Y-Achse aufweist, um ein zwitterartiges Paaren der Öffnungen sowohl um die X-Achse als auch um die Y-Achse zu ermöglichen.

Revendications

1. Système de soupape comprenant:

un premier orifice de réservoir (23) et un second orifice de réservoir (25) qui peuvent être découplés et couplés l'un par rapport à l'autre entre un mode de découplage et un mode de couplage, respectivement;
un premier corps de clapet de soupape (27) monté dans un premier temps dans ledit premier orifice de réservoir (23) et apte à pivoter autour d'un axe, ledit premier corps de clapet de soupape (27) rendant, dans sa position fermée, le premier orifice (23) étanche contre un écoulement de matière à travers ce dernier;
un second corps de clapet de soupape (29) monté dans un premier temps dans ledit second orifice de réservoir (25) et apte à pivoter autour dudit axe, ledit second corps de clapet de soupape (29) rendant, dans sa position fermée, le second orifice (25) étanche contre un écoulement de matière à travers ce dernier, dans lequel, dans ledit mode de couplage, lesdits premier et second corps de clapets de soupapes (27, 29) sont directement adjacents l'un à l'autre et sont à même de pivoter simultanément autour dudit axe pour prendre une position ouverte permettant un écoulement de matière à travers les premier et second orifices;
un premier élément de verrouillage (31) apte à effectuer une rotation de type circonférentiel par rapport au premier orifice (23) depuis une première position circonférentielle jusqu'à une seconde position circonférentielle, dans lequel, dans ladite première position circonférentielle, ledit premier élément de verrouillage (31) verrouille ledit premier corps de clapet de soupape (27) dans ladite position fermée, si bien que le premier corps de clapet de soupape ne peut être déplacé pour prendre ladite position ouverte sans déplacer d'abord l'élément de verrouillage dans ladite seconde position circonférentielle, et dans lequel ledit premier élément de verrouillage déverrouille ledit premier corps de clapet de soupape (27) pour permettre le pivotement dudit premier corps de clapet de soupape (27) dans ladite position ouverte, indépendamment dudit premier élément de verrouillage (31).

2. Système de soupape selon la revendication 1, dans lequel lesdits orifices de réservoirs (23, 25) se trouvent dans ledit mode de couplage lorsque ledit premier élément de verrouillage (31) se trouve dans sa

seconde position circonférentielle, les premier et second corps de soupapes (27, 29) étant à même de pivoter de 180° autour dudit axe pour prendre une position de corps de soupape inversée, et dans lequel, lorsque lesdits corps de soupape (27, 29) se trouvent dans ladite position de corps de soupape inversée, lesdits premier et second orifices de réservoirs (23, 25) ne peuvent être découplés, ledit second corps de clapet de soupape (29) étant monté dans ledit premier orifice de réservoir (23) et ledit premier corps de clapet de soupape (27) étant monté dans ledit second orifice de réservoir (25).

3. Système de soupape selon la revendication 1 ou 2, dans lequel ledit premier élément de verrouillage (31) dans ladite seconde position circonférentielle verrouille en outre le premier orifice (23) et le second orifice (25) l'un à l'autre dans ledit mode de couplage.

4. Système de soupape selon l'une quelconque des revendications précédentes, dans lequel ledit premier corps de clapet de soupape (27) et ledit second corps de clapet de soupape (29) possèdent chacun des faces généralement planes (235, 135) comportant au moins un groupe d'une nervure (237a) et d'une rainure (137a) venant s'insérer l'une dans l'autre, autour de leur périmètre, dans lequel les faces adjacentes dudit premier corps de clapet de soupape (7) et dudit second corps de clapet de soupape (29) adjacents sont mises en contact l'une avec l'autre à l'aide dudit groupe de nervure et de rainure pour procurer un joint étanche à la poussière entre elles dans ledit mode de couplage, par lequel, dans ledit mode de découplage, lesdites faces desdits premier et second corps de clapets de soupapes (27, 29) sont exposées et sont essentiellement exemptes de poussière provenant du premier orifice (23) et du second orifice (25).

5. Système de soupape selon l'une quelconque des revendications précédentes, dans lequel, dans ladite seconde position circonférentielle, ledit premier élément de verrouillage (31) permet auxdits premier et second corps de clapets de soupapes (27, 29) de pivoter de manière sélective entre ladite position fermée et ladite position ouverte, dans lequel lesdits corps de clapets de soupapes (27, 29) sont à même de pivoter sur plus de 360° autour dudit axe lorsque lesdits premier et second orifices de réservoirs (23, 25) se trouvent dans ledit mode de couplage.

6. Système de soupape selon l'une quelconque des revendications précédentes, comprenant en outre une broche (63) mise en état de précontrainte par ressort et un évidement correspondant (61) pour que vienne s'y loger ladite broche, situé entre ledit premier élément de verrouillage (31) et le premier orifice (23), dans lequel ladite broche (63) vient s'insérer dans ledit évidement (61) lorsque ledit premier élément de verrouillage (31) se trouve dans sa première position circonférentielle, et dans lequel ladite broche (63) et ledit évidement (61) s'opposent à une rotation par inadvertance dudit premier élément de verrouillage (31) hors de sa première position circonférentielle pour maintenir ledit premier corps de clapet de soupape (27) verrouillé dans sa position fermée dans ledit mode de découplage.

7. Système de soupape selon l'une quelconque des revendications précédentes, comprenant en outre un second élément de verrouillage (33) apte à effectuer une rotation de type circonférentiel par rapport au second orifice (25) depuis une première position circonférentielle jusqu'à une seconde position circonférentielle, dans lequel, dans ladite première position circonférentielle, ledit second élément de verrouillage (33) verrouille ledit second corps de clapet de soupape (29) dans ladite position fermée et dans lequel, dans ladite seconde position circonférentielle, ledit second élément de verrouillage (33) déverrouille ledit second corps de clapet de soupape (29) pour permettre le pivotement dudit second corps de clapet de soupape (29) pour prendre ladite position ouverte, indépendamment dudit premier élément de verrouillage (31).

8. Système de soupape selon la revendication 7, dans lequel ledit second élément de verrouillage (33) dans ladite seconde position circonférentielle verrouille en outre le premier orifice (23) et le second orifice (25) l'un par rapport à l'autre dans ledit mode de couplage.

9. Système de soupape selon la revendication 7 ou 8, dans lequel, dans ledit mode de découplage, ledit premier corps de clapet de soupape (27), ledit second corps de clapet de soupape (29), ledit premier élément de verrouillage (31) et ledit second élément de verrouillage (33) peuvent être démontés l'un de l'autre et à l'écart du premier orifice (23) et du second orifice (25);

   dans lequel ledit premier corps de clapet de soupape (27) peut être échangé contre ledit second corps de clapet de soupape (29); et
   dans lequel ledit premier élément de verrouillage (31) peut être échangé contre ledit second élément de verrouillage (33).

10. Système de soupape selon l'une quelconque des revendications précédentes, comprenant en outre un moyen élastomère (28) entre ledit premier corps de clapet de soupape (27) et ledit premier orifice de réservoir (23), et entre ledit second corps de clapet

de soupape (29) et ledit second orifice de réservoir (25) pour procurer un joint étanche.

11. Système de soupape selon l'une quelconque des revendications précédentes, dans lequel ledit premier orifice de réservoir et ledit second orifice de réservoir présentent une capacité d'insertion réciproque de type hermaphrodite;

et dans lequel lesdits orifices de réservoirs possèdent un groupe de saillies mâles (159, 167) et un groupe d'évidements femelles (161, 169) qui dévient par rapport à un plan transversal X-Y défini par un axe des Y transversal et par un axe des X transversal, dans lequel une saillie mâle donnée (159) possède un premier évidement d'insertion réciproque (169) situé en position symétrique à travers ledit axe des X et un second évidement d'insertion réciproque (161) situé en position symétrique à travers ledit axe des Y pour permettre l'accouplement hermaphrodite desdits orifices à la fois autour dudit axe des X et autour dudit axe des Y.

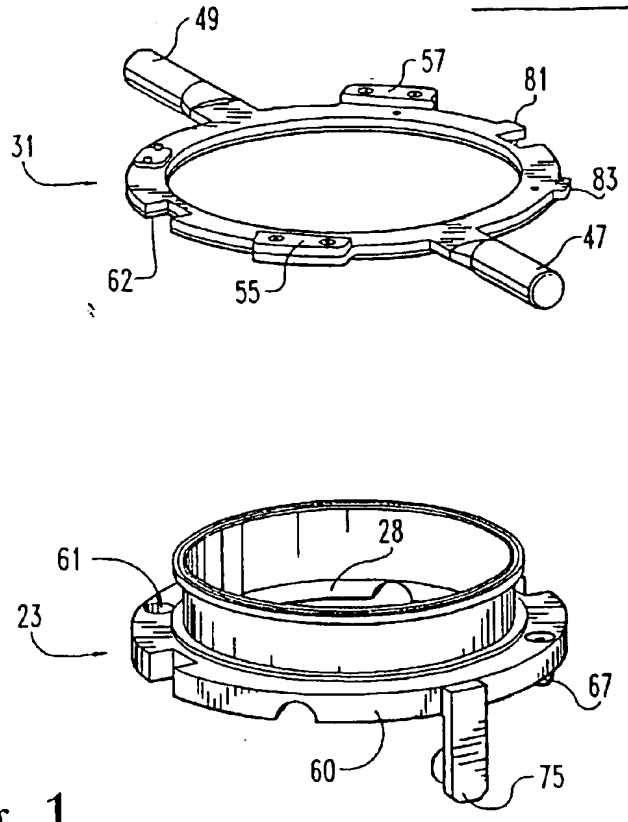
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Fig.1

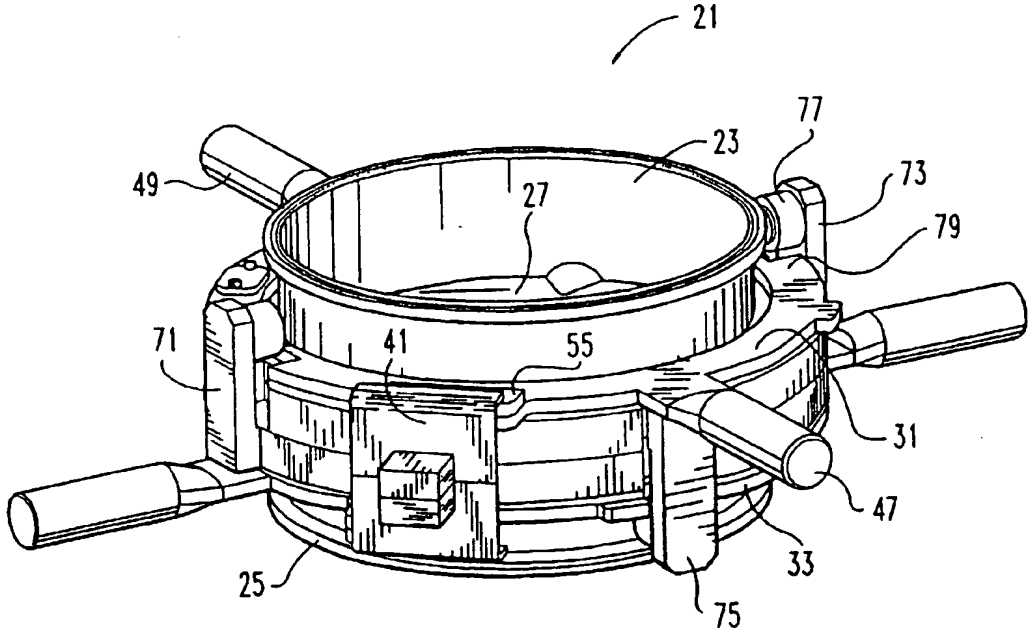
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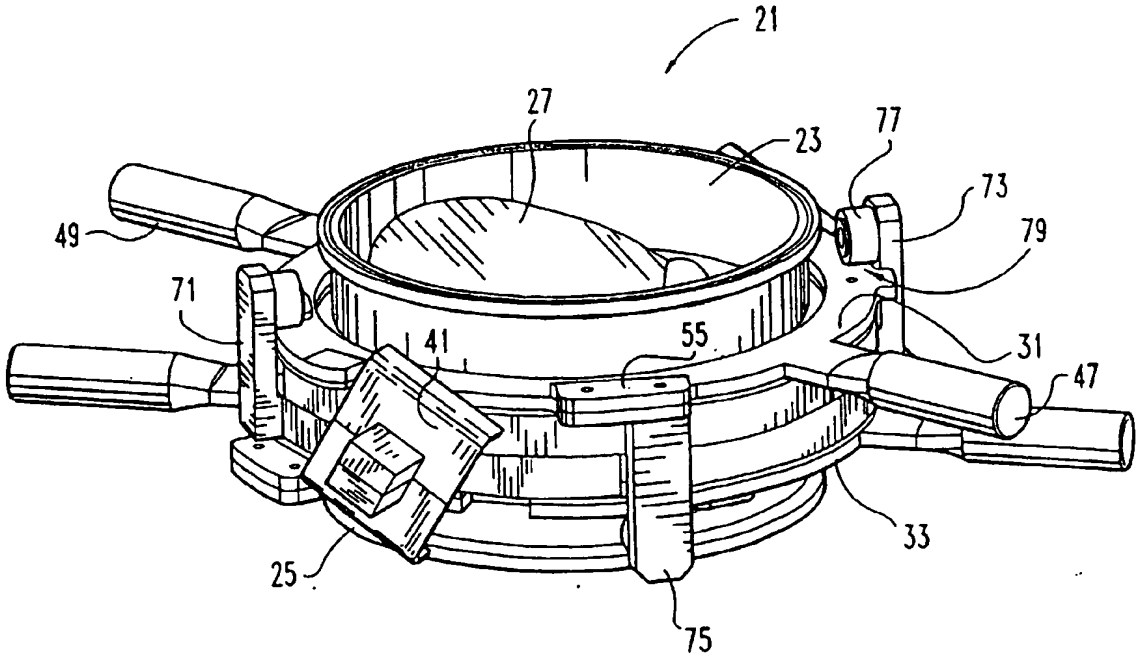
Fig. 2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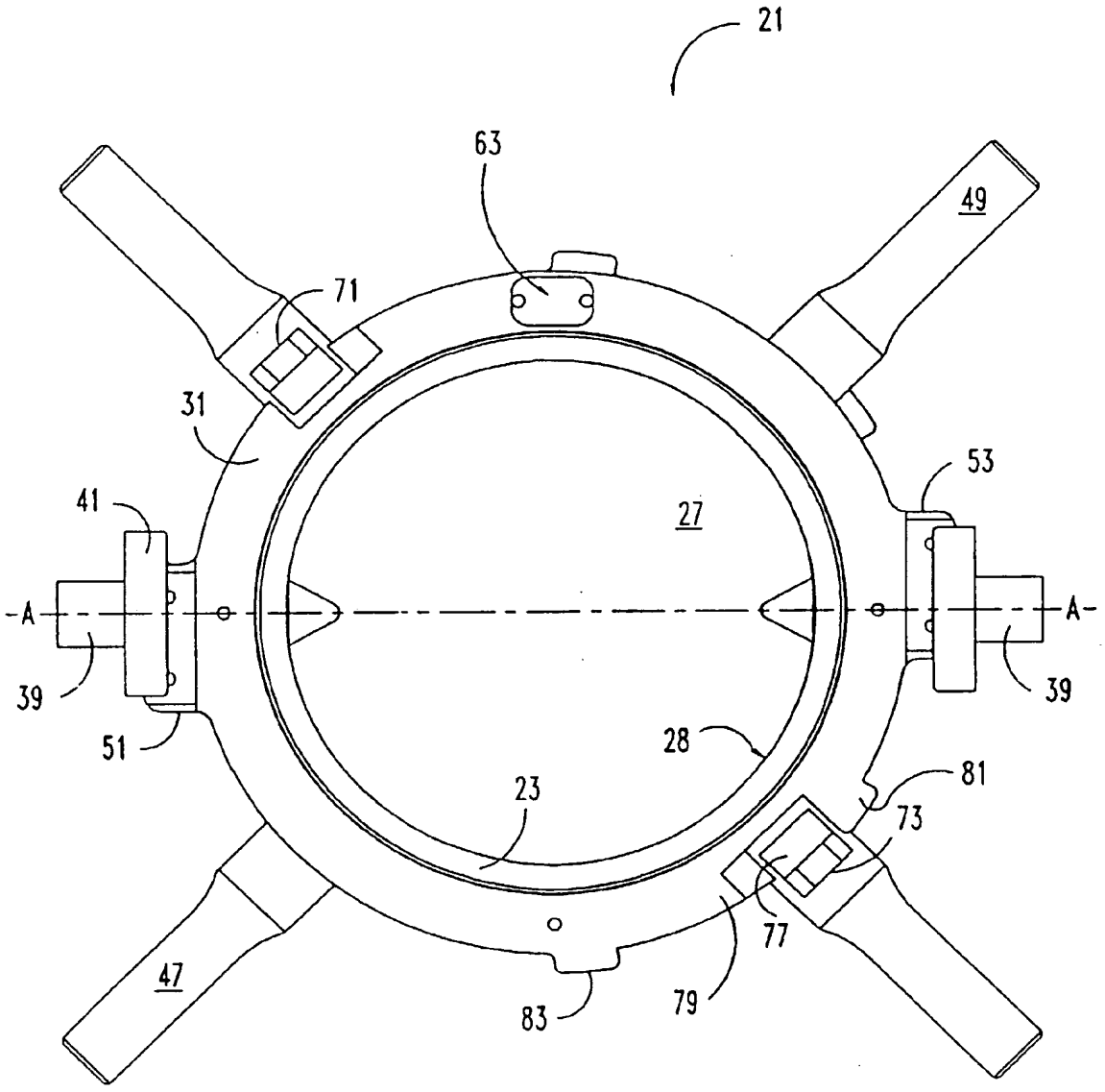

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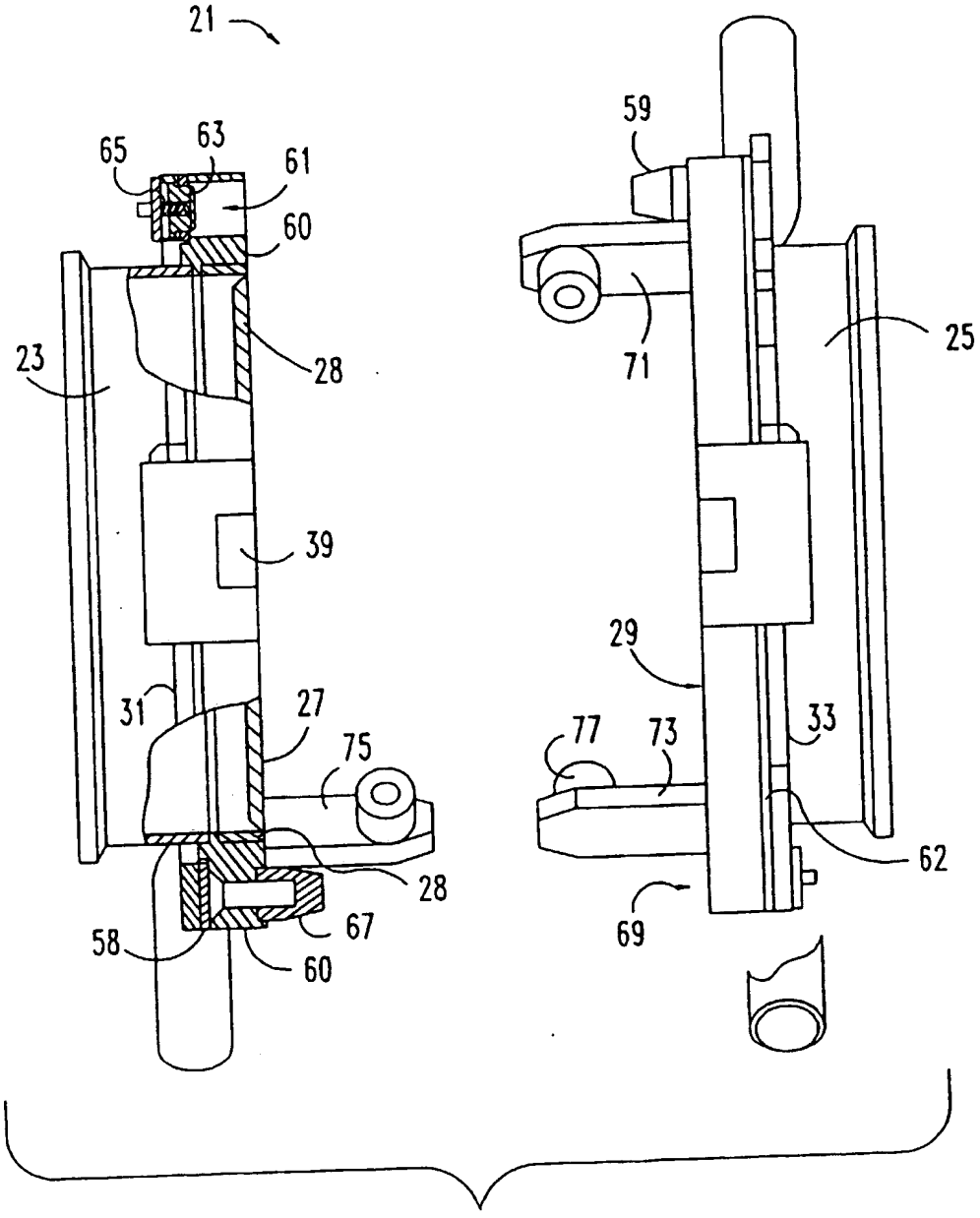

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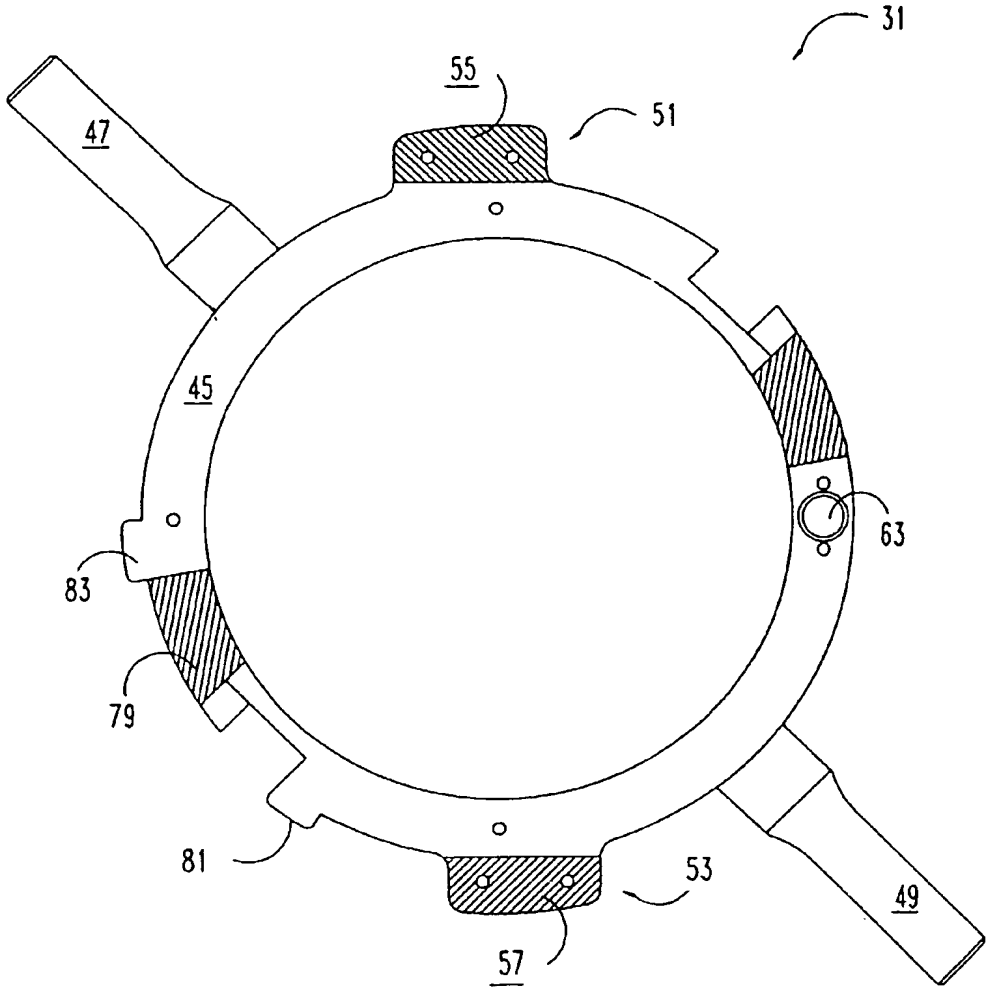

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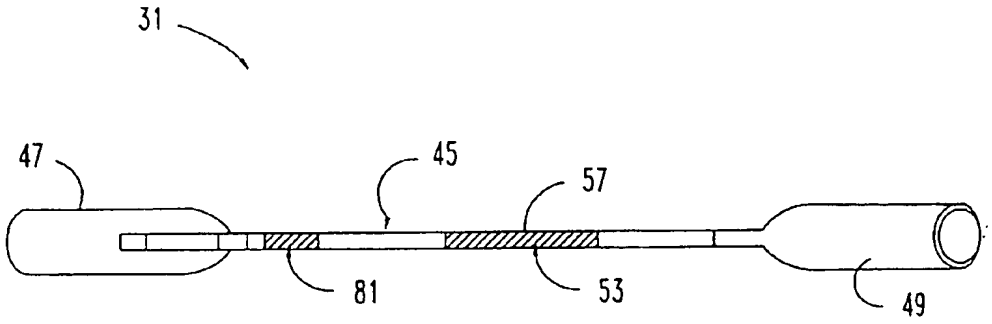

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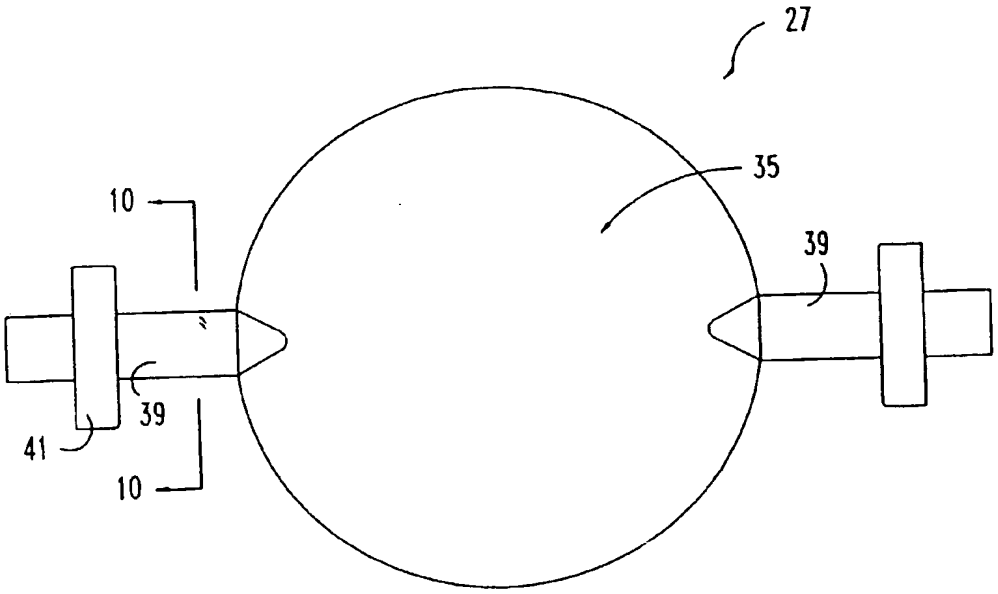

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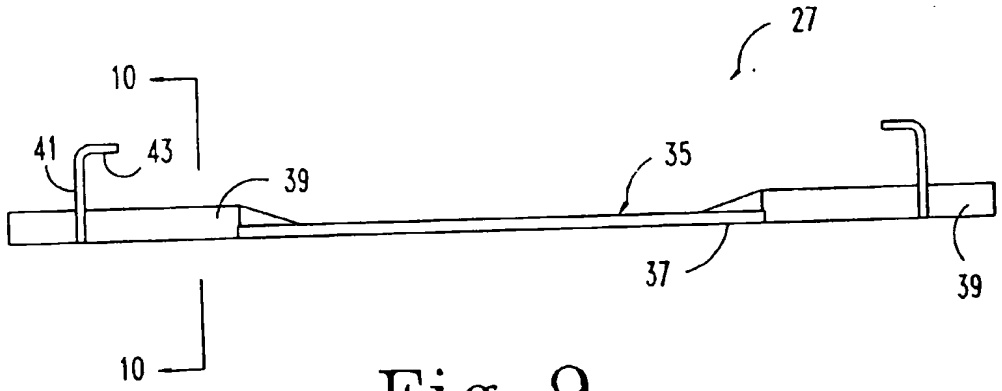

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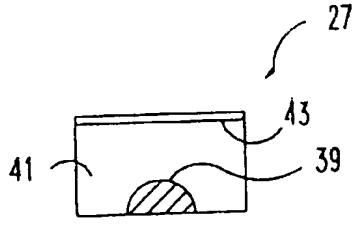

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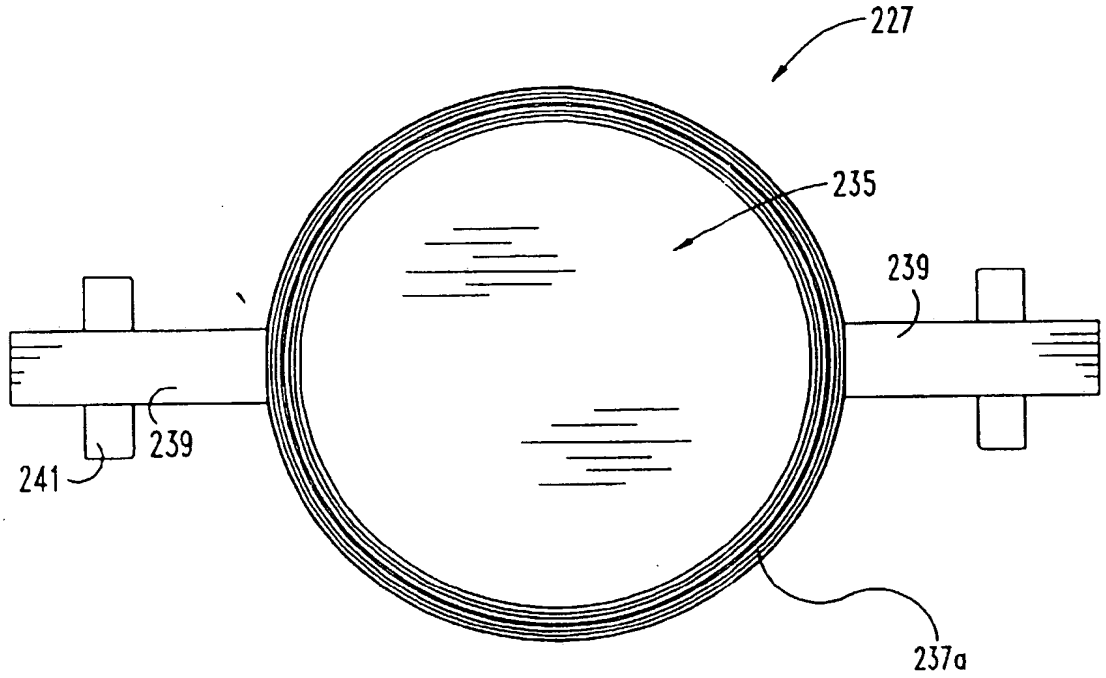

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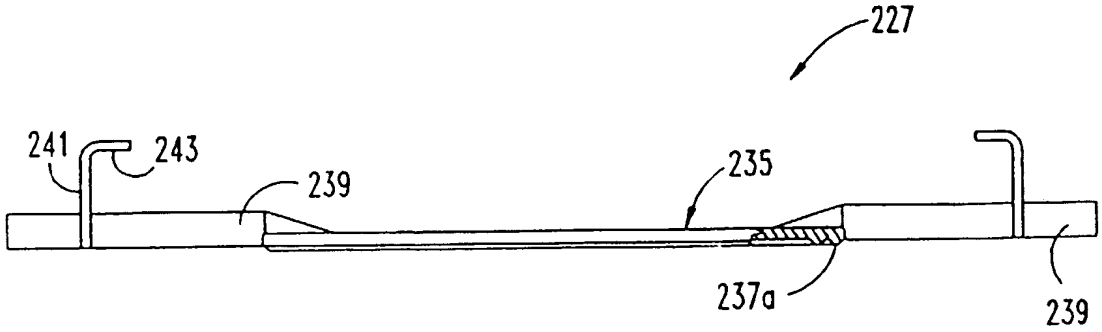

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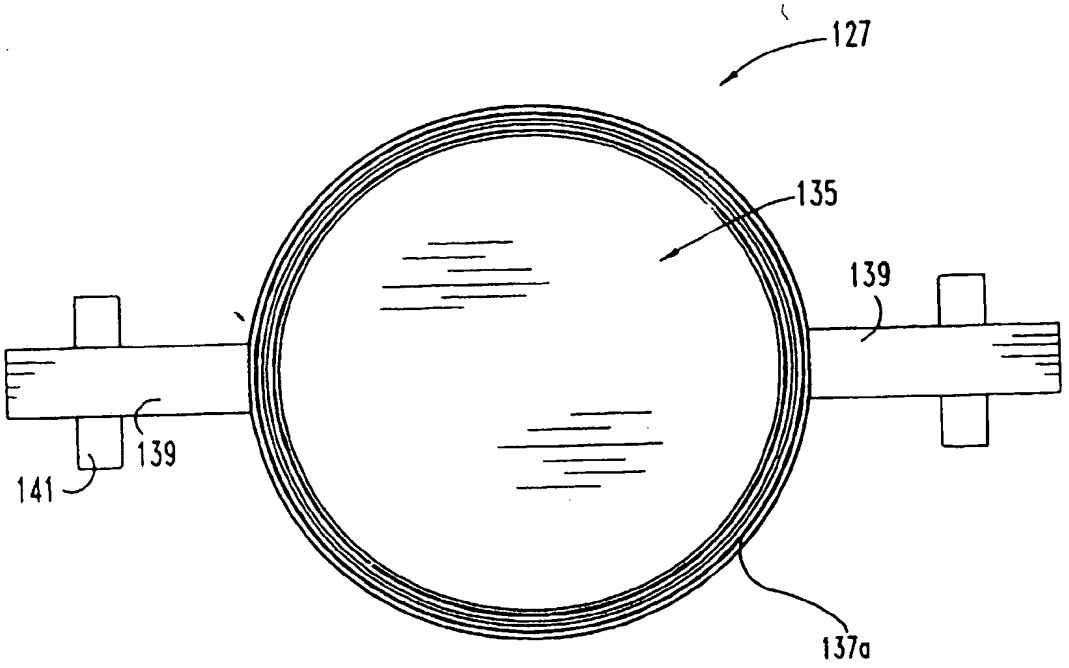

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Fig.14

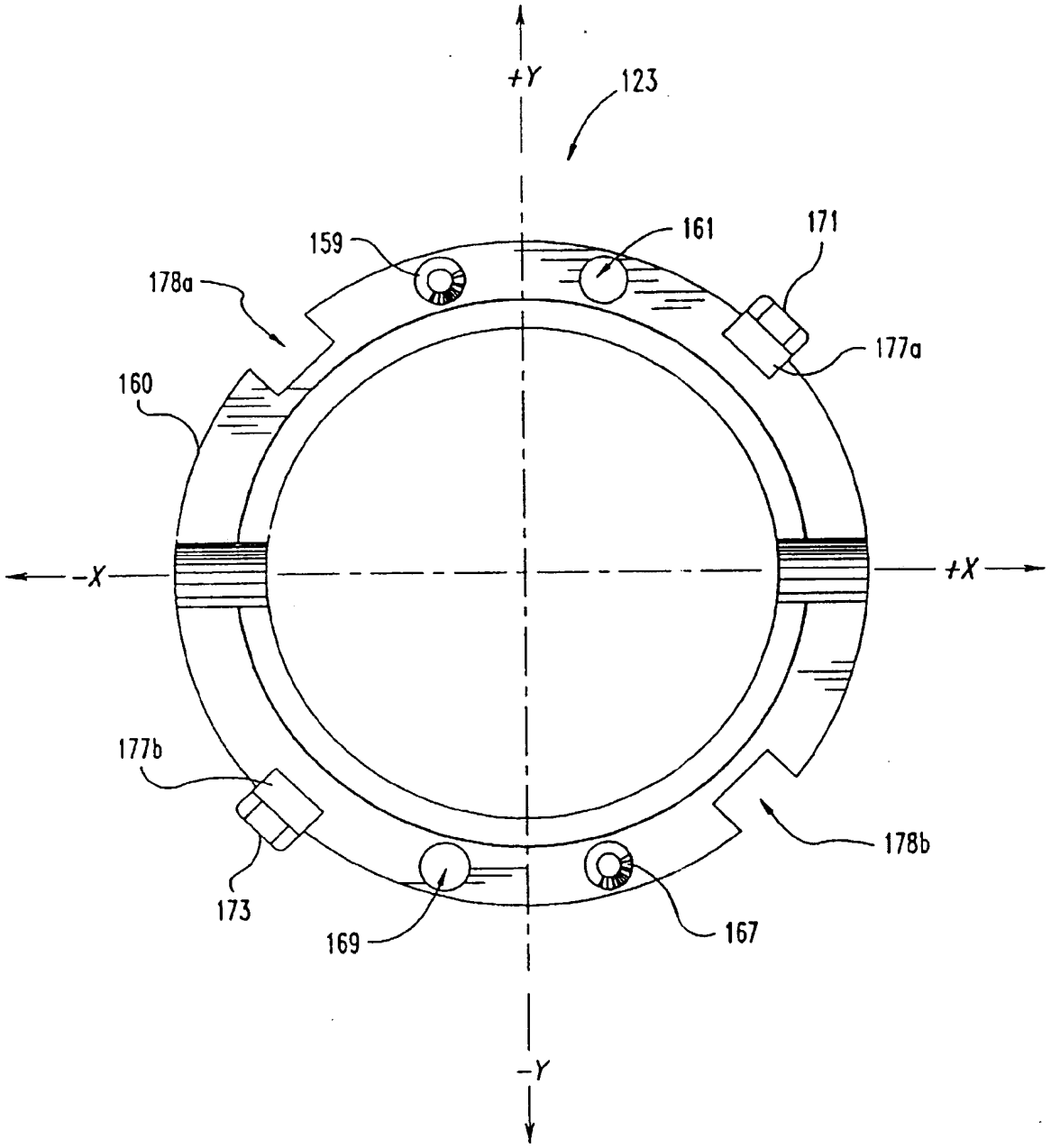

Fig. 15

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